THE EFFECTS OF SUGAR TYPES AND CONCENTRATION ON THE QUALITY OF RSP CHERRIES AND PEACHES

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There has been an increasing interest in the cherry industry during recent years in the use of syrup pack RSP cherries using either sucrose or sucrose-dextrose sugar. The replacement of part of the sucrose syrup with other sweetening agents such as invert sugar, dextrose, corn syrup or glucose has been the trend throughout the fruit industry, because these replacement syrups are readily available and are less expensive. Conflicting reports have appeared as to the relative merits of using these syrups in canned and frozen fruits. This study was designed to determine the effect of sucrose, corn syrup solids with sucrose, and corn syrup with sucrose on the quality of canned RSP cherries and canned and frozen peaches.

Experimental Procedures:

The RSP cherries used in this study were packed by the Gypsum Canning Company. The peaches were canned and frozen in the pilot plant at the Ohio Agricultural Experiment Station. Table 1 contains the various sugar treatments which were used for both the RSP cherries and the peaches. The sugar syrups were used in two concentrations - 40° Brix and 60° Brix. The corn syrup solids varied in their dextrose equivalent (D.E.) or degree of conversion. The higher the D.E. the larger the total amount of reducing sugars contained in the product. The D.E. sugars were used to replace sucrose at two percentages - 1/3 D.E. sugars, 2/3 sucrose and 1/4 D.E. sugars, 3/4 sucrose, while the corn syrup was used to replace the sucrose at one percentage - 1/4 corn syrup, 3/4 sucrose. The quality of the RSP cherries was evaluated after storage periods of 1 day, 1 month, 3 months, and 6 months. Taste panels were conducted on the 6 month storage samples. The quality of the canned and frozen peaches was evaluated on the fresh peaches and at storage periods of 1 month and 3 months.

Results:

1. RSP cherries.

The results of the analysis of the RSP cherries at the different storage periods are presented in Table 2. The cherries and the medium in which they were packed were analyzed separately so that changes in both could be evaluated. Changes in the major quality indices which occur during storage were apparently unaffected by the type of sugar but were affected by the concentration of the sugar. The soluble solids of the juice in the water pack and the 40° Brix samples increased during storage, while the soluble solids of the 60° Brix samples decreased during storage.

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The soluble solids of the cherries, however, increased during storage regardless of the concentration of the sugars. The total acids decreased during storage regardless of treatment with a greater decrease occurring in the cherries. The resulting sugar/acid ratio of the juice and the cherries were almost identical within each treatment. The variation in the sugar/acid ratios between the 40° Brix samples was from 26.5 to 31.8, and from 33.4 to 39.4 between treatments at 60° Brix.

The color of the RSP cherries was evaluated at each storage period by the Hunter Color and Color Difference Meter, the percent transmission of the packing medium, and by a taste panel at the 6-month storage period. The Hunter "L" values, which are a measure of brightness, indicate that after 6 months of storage the samples packed in the 60° Brix syrup, the sucrose samples in particular, had a slightly brighter color than those packed in a 40° Brix syrup or water. The Hunter a/b value, which is a measure of redness, showed variations of only 0.18 between treatments. The transmission percent of the juice of the various treatments indicated that the juice of the water pack samples was of a redder color than the juice of the other treatments. A taste panel could detect no significant difference in color between sugar treatments or sugar concentrations.

An evaluation of flavor was also made at the 6 month storage period by a taste panel and these results indicate that RSP cherries packed in a 60° Brix syrup would make a highly acceptable dessert product. As expected, the water pack samples had a significantly lower score than any of the samples containing sugar. There was, however, no significant difference between treatments either in the 40° Brix concentrations or the 60° Brix concentrations. The samples containing the corn syrup were scored considerably lower at both concentrations, and some off-flavor could be detected in the 40° Brix samples.

Triangular taste tests were conducted in all 60° Brix treatments and the only treatments in which the panel could detect a flavor difference were between the 1/3 42 D.E. sugar, 2/3 sucrose vs. 1/4 42 D.E. sugar, 3/4 sucrose samples and the 1/3 62 D.E. sugar, 2/3 sucrose vs. 1/4 62 D.E. sugar, 3/4 sucrose. There was no flavor preference in the samples containing the 42 D.E. sugar, but in the samples containing the 62 D.E. sugar the 1/4 62 D.E. sugar samples were preferred over those containing 1/3 62 D.E. sugar.

2. Peaches.

The results of the sugar studies on peaches are still incomplete since the samples have not yet been in storage for 6 months. The results of analysis of canned peaches obtained thus far are shown in Table 3. These results indicate that the storage period has a similar effect on the soluble solids and total acids as was shown in the RSP cherries, with the resulting sugar/acid ratios of the peaches and the juice after 3 months storage being almost the same within treatments. The Hunter La/b values show that the best color apparently occurs in the 40° Brix samples containing the 1/3 42 D.E. sugar and the 1/4 42 D.E. sugar, and the 60° Brix corn syrup samples. However, color slides of the 3 month storage samples indicate that generally the 60° Brix samples had a better color regardless of the sugar treatment.

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The results of the analysis on frozen peaches are given in Table 4. These results show that generally as the storage time increased the total acids decreased slightly and the soluble solids increased, thus increasing the sugar/acid ratio. The sugar treatment or concentration apparently had no effect on these factors. A visual color determination was made at the 3 month storage period and no color differences were noted between either the sugar treatments or concentrations.

These studies are not yet completed on either the RSP cherries or peaches. The RSP cherries will be objectively and subjectively evaluated at the 1 year storage period and the peaches will be evaluated at the 6 month and 1 year storage period.

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TABLE 1 EXPLANATION OF SUGAR TREATMENTS USED IN CANNED RSP CHERRIES AND CANNED AND FROZEN PEACHES.

CODE	INPUT BRIX	SUGAR TREATMENT
C	-	None (Water Pack)
2-4 2-6	40° 60°	Sucrose
3-4 3-6	40° 60°	2/3 Sucrose, 1/3 42 D.E. Corn Syrup Solids
4-4 4-6	40° 60°	2/3 Sucrose, 1/3 62 D.E. Corn Syrup Solids
5-4 5-6	40° 60°	3/4 Sucrose, 1/4 42 D.E. Corn Syrup Solids
6-4 6-6	40° 60°	3/4 Sucrose, 1/4 62 D.E. Corn Syrup Solids
7-4 7-6	40° 60°	3/4 Sucrose, 1/4 Regular Grade Corn Syrup

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TABLE 2 THE EFFECT OF SUGAR TREATMENT AND CONCENTRATION ON THE QUALITY OF CANNED RSP CHERRIES.

TREATMENT		STORAGE PERIOD	SOLUBLE SOLIDS	SUGAR/ ACID RATIO	HUNTER COLOR L	a/b	% TRANS. AT 750 mu.	SUBJECTIVE EVALUATION FLAVOR	COLOR
C	Juice	1 day	9.0	10.49			-		
	Cherries		9.75	10.72	16.8	1.21			
	Juice	1 mo.	9.25	9.89			74.5		
	Cherries		8.75	8.98	24.7	2.03			
	Juice	3 mo.	9.2	10.64			79.0		
	Cherries		9.8	11.09	25.4	2.41			
	Juice	6 mo.	10.9	14.34			60.0		
	Cherries		11.6	14.66	34.6	1.98		3.9	5.9
2-4	Juice	1 day	21.0	28.07			-		
	Cherries		19.75	22.19	15.9	0.82			
	Juice	1 mo.	21.0	25.24			80.0		
	Cherries		20.5	24.45	24.4	2.04			
	Juice	3 mo.	21.1	24.78			85.0		
	Cherries		21.1	24.41	20.6	2.45			
	Juice	6 mo.	20.8	31.79			76.0		
	Cherries		23.8	31.84	34.7	1.82		6.0	6.9
2-6	Juice	1 day	31.5	42.84			-		
	Cherries		25.5	25.18	19.1	1.97			
	Juice	1 mo.	30.0	36.34			80.0		
	Cherries		29.0	34.06	22.1	1.96			
	Juice	3 mo.	28.6	34.91			85.5		
	Cherries		29.8	35.00	17.6	1.75			
	Juice	6 mo.	27.1	38.45			72.0		
	Cherries		29.3	37.03	22.7	1.83		6.9	6.5
3-4	Juice	1 day	19.3	24.33			-		
	Cherries		18.0	18.48	20.2	2.00			
	Juice	1 mo.	20.5	24.45			80.0		
	Cherries		20.0	24.61	23.4	2.06			
	Juice	3 mo.	19.2	21.57			85.5		
	Cherries		19.0	21.19	27.2	2.34			
	Juice	6 mo.	21.2	30.94			70.5		
	Cherries		22.8	29.51	33.0	1.85		6.3	6.4
3-6	Juice	1 day	33.0	47.37			-		
	Cherries		25.0	25.33	18.6	1.72			
	Juice	1 mo.	27.5	32.80			83.5		
	Cherries		25.5	29.28	22.8	1.90			
	Juice	3 mo.	25.0	28.29			85.0		
	Cherries		25.8	28.17	18.9	1.85			
	Juice	6 mo.	26.9	37.22			78.5		
	Cherries		29.4	37.76	30.8	1.87		5.9	7.0

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TABLE 2 (CONT'D)

TREATMENT		STORAGE PERIOD	SOLUBLE SOLIDS	SUGAR/ ACID RATIO	HUNTER COLOR L	a/b	% TRANS. AT 750 mu.	SUBJECTIVE EVALUATION FLAVOR	COLOR
4-4	Juice	1 day	20.75	26.15			-		
	Cherries		19.75	20.73	20.6	2.01			
	Juice	1 mo.	19.3	20.78			86.0		
	Cherries		19.5	22.39	23.7	1.93			
	Juice	3 mo.	20.0	24.04			88.0		
	Cherries		20.5	24.45	21.2	1.83			
	Juice	6 mo.	21.0	30.09			73.5		
	Cherries		22.5	28.66	32.8	1.80		6.1	6.3
4-6	Juice	1 day	30.2	40.36			-		
	Cherries		23.5	23.36	18.4	1.73			
	Juice	1 mo.	30.2	35.20			83.5		
	Cherries		30.5	36.09	22.7	1.87			
	Juice	3 mo.	26.5	31.36			85.0		
	Cherries		26.9	30.22	20.1	2.11			
	Juice	6 mo.	25.0	33.44			73.0		
	Cherries		26.8	33.61	31.9	1.82		6.9	6.2
5-4	Juice	1 day	20.75	26.15			-		
	Cherries		19.0	20.31	20.0	2.22			
	Juice	1 mo.	21.0	24.12			85.5		
	Cherries		20.5	23.20	23.1	2.03			
	Juice	3 mo.	21.0	23.94			83.0		
	Cherries		21.1	23.88	19.4	2.21			
	Juice	6 mo.	21.2	29.85			77.5		
	Cherries		23.2	30.78	33.0	1.88		5.9	6.5
5-6	Juice	1 day	29.5	39.43			-		
	Cherries		25.0	25.17	18.6	2.00			
	Juice	1 mo.	28.0	32.64			86.5		
	Cherries		27.2	30.56	22.5	1.98			
	Juice	3 mo.	27.5	31.12			86.0		
	Cherries		27.5	30.03	20.3	1.59			
	Juice	6 mo.	27.6	37.55			77.5		
	Cherries		29.6	38.01	30.5	1.89		6.7	6.9

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TABLE 2 (C NT'D)

TREATMENT		STORAGE PERIOD	SOLUBLE SOLIDS	SUGAR/ ACID RATIO	HUNTER COLOR L	HUNTER COLOR a/b	% TRANS. AT 750 mu.	SUBJECTIVE EVALUATION FLAVOR	SUBJECTIVE EVALUATION COLOR
6-4	Juice	1 day	21.25	26.78			-		
	Cherries		20.00	21.68	19.2	2.22			
	Juice	1 mo.	19.8	21.93			85.0		
	Cherries		19.2	22.05	22.7	2.11			
	Juice	3 mo.	19.0	21.66			85.0		
	Cherries		19.4	21.64	24.5	2.44			
	Juice	6 mo.	19.9	27.54			77.5		
	Cherries		20.5	26.54	33.7	1.97		5.5	6.1
6-6	Juice	1 day	32.8	47.97			-		
	Cherries		25.5	26.18	16.6	1.27			
	Juice	1 mo.	24.5	26.56			83.5		
	Cherries		24.5	25.84	21.8	2.03			
	Juice	3 mo.	26.2	31.25			85.0		
	Cherries		26.6	30.55	19.7	1.81			
	Juice	6 mo.	27.3	39.48			77.5		
	Cherries		29.2	39.38	29.7	1.90		6.9	6.8
7-4	Juice	1 day	20.0	21.53			-		
	Cherries		20.5	24.83	17.5	1.50			
	Juice	1 mo.	19.2	21.73			84.5		
	Cherries		19.2	21.73	23.4	1.98			
	Juice	3 mo.	21.0	24.48			85.5		
	Cherries		21.2	23.99	19.5	2.00			
	Juice	6 mo.	21.5	30.54			78.0		
	Cherries		22.9	30.89	33.9	1.87		4.9	5.9
7-6	Juice	1 day	33.1	45.41			-		
	Cherries		26.0	26.01	16.9	1.30			
	Juice	1 mo.	30.2	37.76			86.5		
	Cherries		29.0	33.55	21.7	1.90			
	Juice	3 mo.	28.5	32.49			82.5		
	Cherries		28.5	30.90	20.4	2.36			
	Juice	6 mo.	28.0	37.77			70.0		
	Cherries		30.4	39.03	31.8	1.84		6.1	6.0

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TABLE 3 THE EFFECT OF SUGAR TREATMENT AND CONCENTRATION ON THE QUALITY OF CANNED ELBERTA PEACHES.

TREATMENT		STORAGE PERIOD	SOLUBLE SOLIDS	SUGAR/ACID RATIO	HUNTER La/b COLOR VALUES	% TRANS. AT 525 mu.
Raw peaches			9.0	16.05	-	-
C	Juice	1 day	6.0	14.76		60.0
	Peaches		6.5	14.60	0.25	-
	Juice	3 mo.	7.9	16.78	-	44.0
	Peaches		8.1	17.69	1.33	-
2-4	Juice	1 day	16.5	37.62	-	55.0
	Peaches		15.5	31.21	0.21	-
	Juice	3 mo.	16.1	35.15	-	55.5
	Peaches		16.8	34.73	1.86	-
2-6	Juice	1 day	27.0	69.77	-	57.5
	Peaches		16.5	28.42	0.21	-
	Juice	3 mo.	21.0	47.18	-	54.5
	Peaches		22.1	46.93	0.93	
3-4	Juice	1 day	16.75	41.88	-	53.5
	Peaches		14.5	29.58	0.22	-
	Juice	3 mo.	15.3	35.40	-	66.0
	Peaches		15.9	34.72	0.23	-
3-6	Juice	1 day	23.0	55.72	-	56.0
	Peaches		17.5	35.23	0.22	-
	Juice	3 mo.	21.0	48.59	-	60.5
	Peaches		22.8	50.50	0.44	-
4-4	Juice	1 day	16.5	33.22	-	60.0
	Peaches		13.0	24.28	0.22	-
	Juice	3 mo.	15.5	38.76	-	57.5
	Peaches		16.6	38.99	1.22	-
4-6	Juice	1 day	24.0	63.06	-	63.0
	Peaches		16.5	33.66	0.22	-
	Juice	3 mo.	21.0	51.67	-	66.5
	Peaches		22.2	52.95	0.95	-
5-4	Juice	1 day	17.5	40.49	-	57.0
	Peaches		14.0	26.79	0.22	-
	Juice	3 mo.	16.1	36.17	-	52.5
	Peaches		16.2	34.88	0.24	-
5-6	Juice	1 day	24.0	59.05	-	62.0
	Peaches		16.5	31.98	0.21	-
	Juice	3 mo.	20.5	47.43	-	56.0
	Peaches		21.5	47.62	1.00	-

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TABLE 3 (CONT'D)

TREATMENT	STORAGE PERIOD	SOLUBLE SOLIDS	SUGAR/ACID RATIO	HUNTER La/b COLOR VALUES	% TRANS. AT 525 mu.
6-4 Juice	1 day	17.5	43.06	-	60.5
Peaches		17.5	38.76	0.23	-
Juice	3 mo.	16.2	34.40	-	47.0
Peaches		16.6	33.42	3.11	-
6-6 Juice	1 day	26.5	68.48	-	59.0
Peaches		18.8	37.75	0.23	-
Juice	3 mo.	20.3	42.53	-	54.0
Peaches		21.2	42.68	0.75	-
7-4 Juice	1 day	19.0	48.28	-	60.0
Peaches		15.8	32.55	0.22	-
Juice	3 mo.	16.0	38.16	-	64.0
Peaches		16.8	38.28	1.74	-
7-6 Juice	1 day	-	-	-	-
Peaches		19.0	38.75	0.23	-
Juice	3 mo.	20.1	43.89	-	59.0
Peaches		21.6	45.25	0.23	-

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TABLE 4 THE EFFECT OF SUGAR TREATMENT AND CONCENTRATION ON THE QUALITY OF FROZEN HALEHAVEN PEACHES.

TREATMENT	STORAGE PERIOD	pH	TOTAL ACIDS	SOLUBLE SOLIDS	SUGAR/ACID RATIO
Raw peaches		3.50	.65	11.75	17.90
C	1 day	3.92	.46	8.2	17.90
	3 mo.	4.10	.39	10.0	25.41
2-4	1 day	3.72	.39	14.3	36.95
	3 mo.	4.05	.42	16.0	38.16
2-6	1 day	3.60	.50	16.1	32.00
	3 mo.	4.10	.34	23.0	68.57
3-4	1 day	3.60	.54	13.1	24.47
	3 mo.	4.00	.48	16.5	34.57
3-6	1 day	3.62	.52	15.5	29.67
	3 mo.	4.00	.46	19.0	41.48
4-4	1 day	3.60	.48	13.5	27.90
	3 mo.	4.02	.45	16.6	36.77
4-6	1 day	3.55	.55	16.1	29.02
	3 mo.	4.00	.50	20.5	40.75
5-4	1 day	3.60	.46	15.2	32.73
	3 mo.	4.00	.50	17.0	33.79
5-6	1 day	3.70	.46	16.1	35.15
	3 mo.	4.05	.40	22.0	55.01
6-4	1 day	3.70	.42	13.1	31.24
	3 mo.	4.10	.44	18.1	41.27
6-6	1 day	3.62	.45	17.0	37.65
	3 mo.	4.00	.50	23.4	46.51
7-4	1 day	3.65	.46	13.0	28.38
	3 mo.	4.08	.43	17.0	39.33
7-6	1 day	3.60	.49	17.1	34.88
	3 mo.	4.02	.41	19.5	47.25

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